Environment, Energy Security & Sustainability
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# Hill AFB's Focus on Sustainable Choices in Environmental Restoration

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75th AIR BASE WING

# Report Documentation Page

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# Goals

**E2S2** – Provide an opportunity to share ideas on how to improve energy, environmental and sustainability management

**My Presentation** – Give you the roadmap of the steps taken by Hill AFB Restoration Program to enable more sustainable solutions for remediation systems

# Presentation Outline

- Sustainability Drivers
- Overview Hill AFB
- Two Approaches
- Results
- Lessons Learned

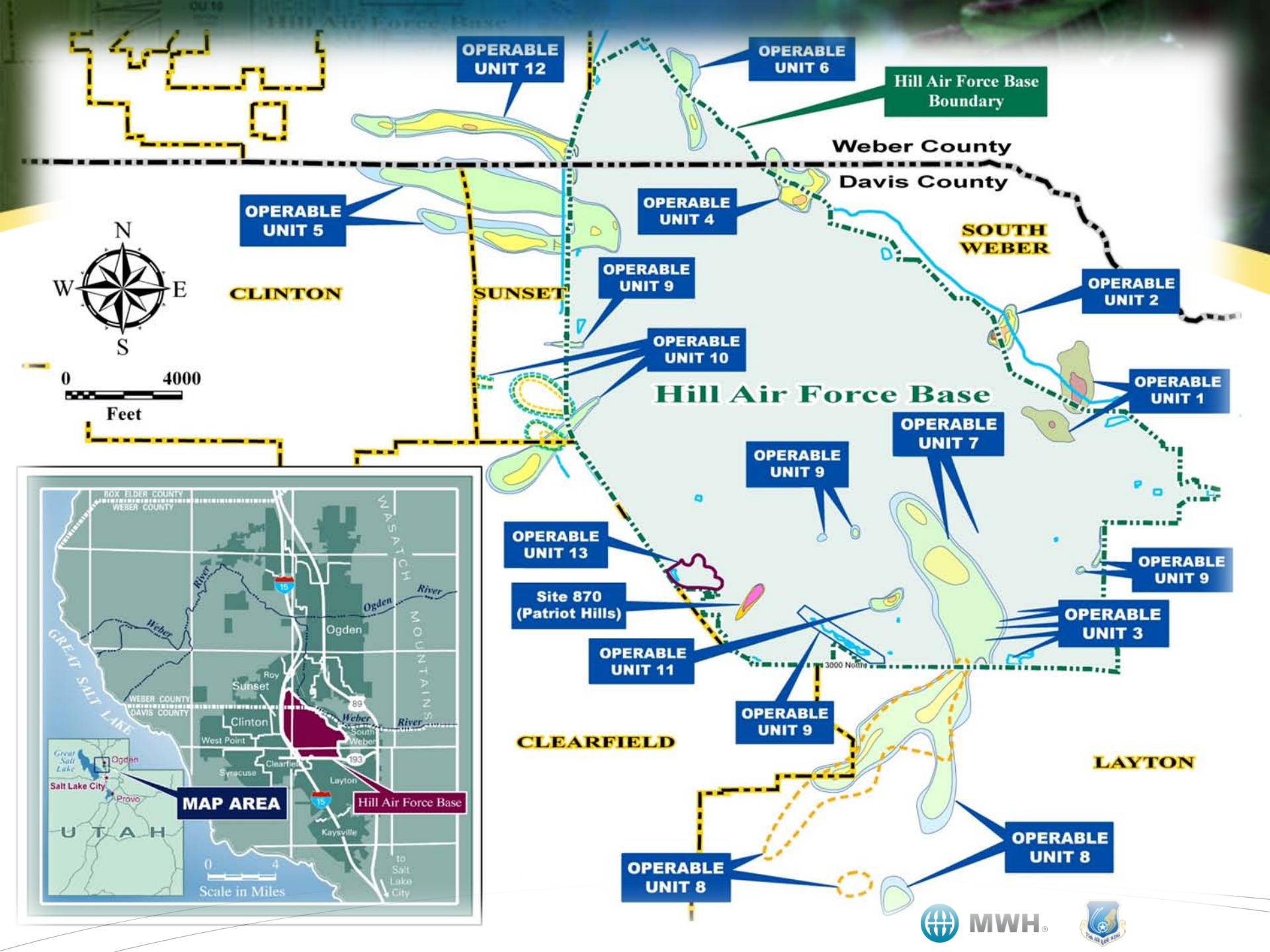
# Sustainability Drivers

Environmental stewardship

Fiscal responsibility

## Formal drivers

- Executive Orders
- AF Infrastructure Energy Strategic Plan
- US EPA – Green Remediation
- DoD Memorandum of 10 August 2009 – specific to GR


OPERABLE UNIT 12
OPERABLE UNIT 6
Hill Air Force Base Boundary
Weber County
Davis County
OPERABLE UNIT 5
OPERABLE UNIT 4
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Site 870 (Patriot Hills)
OPERABLE UNIT 3
OPERABLE UNIT 11
3000 North
OPERABLE UNIT 9
CLEARFIELD
LAYTON
OPERABLE UNIT 8
OPERABLE UNIT 8
BOX ELDER COUNTY
WEBER COUNTY
WASATCH MOUNTAINS
GREAT SALT LAKE
Ogden
Roy
Sunset
Clinton
West Point
Syracuse
Clearfield
Layton
Kaysville
South Weber
WEBER COUNTY
DAVIS COUNTY
Great Salt Lake
Salt Lake City
Provo
U T A H
MAP AREA
Hill Air Force Base
Scale in Miles
To Salt Lake City
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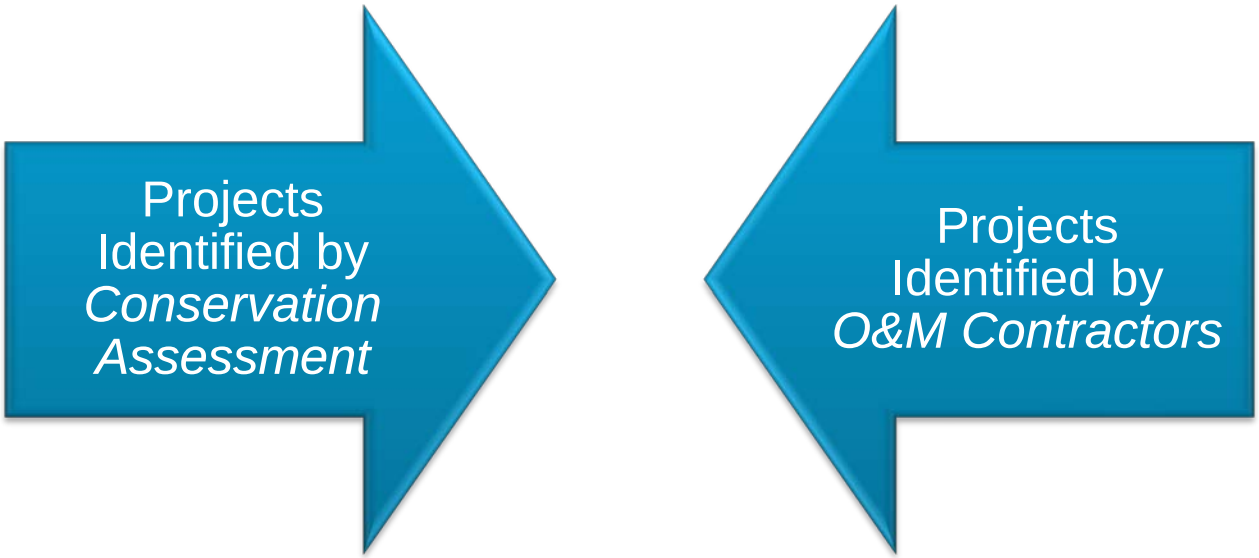
# Approaches

Two Approaches for Identifying Energy, Carbon, Water, and Labor Savings

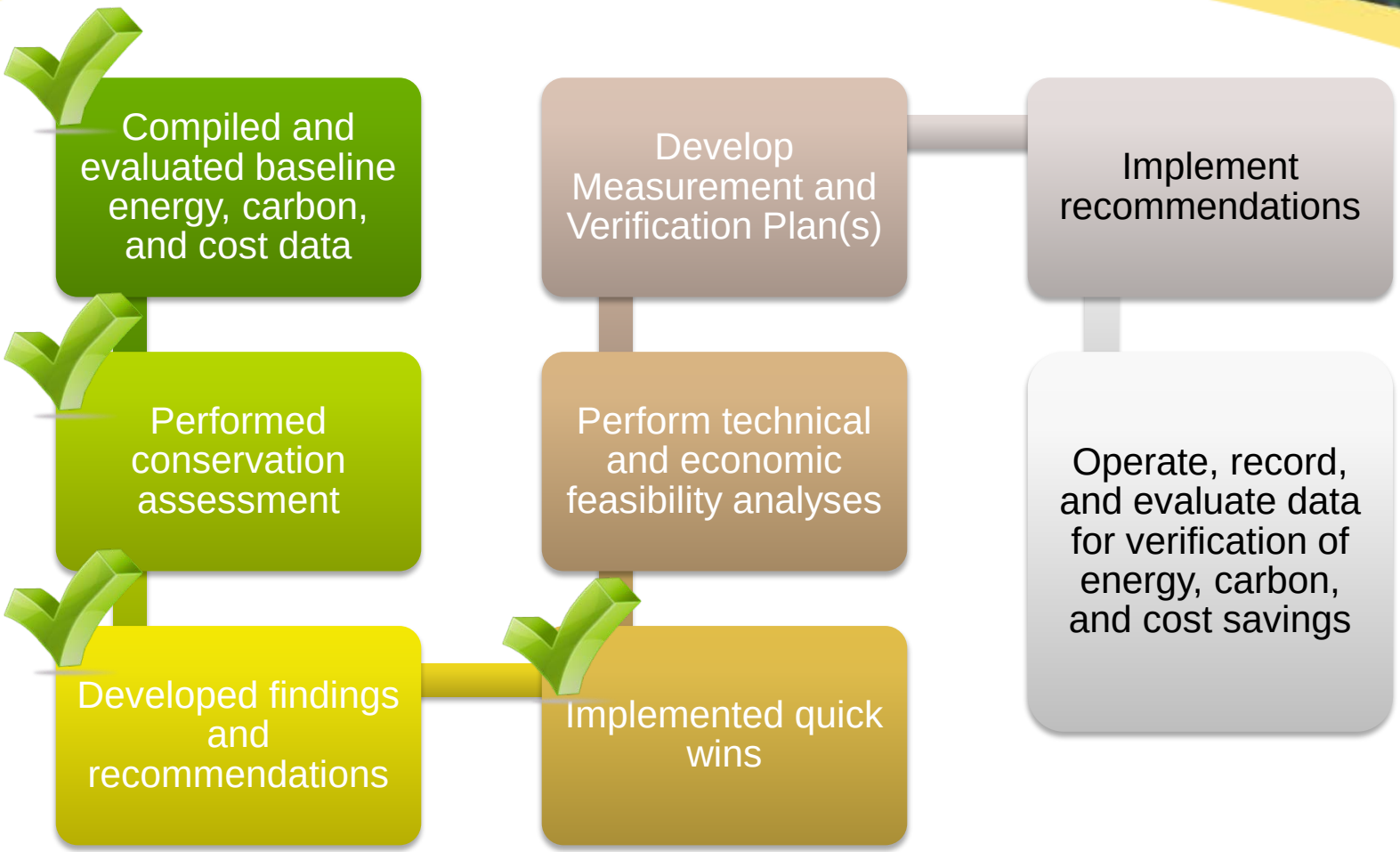



Each Approach Had Different Incentives

# Projects Identified by the Conservation Assessment

*Primary Incentive: Energy, Carbon and Water Use Reductions*

# Conservation Assessment Approach



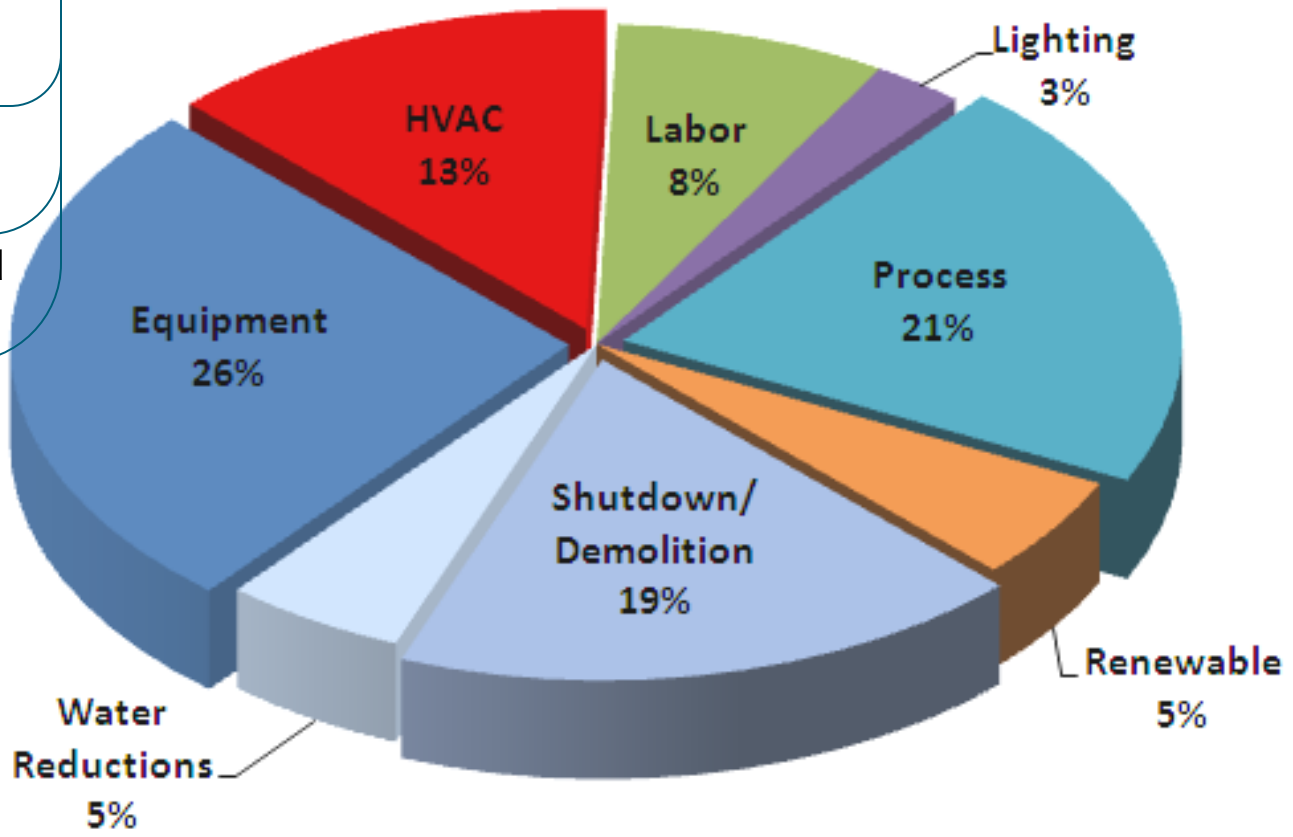
# Conservation Assessment Recommendations

**35** site-specific, **3** basewide

**Estimated Savings**
395,000 kWh/yr (35%)
358,000 lb $CO_2$/yr (29%)
$268,500 (17%)

**Estimated Investment**
$652,000

**Estimated Payback Period**
2.4 years



# Next Steps

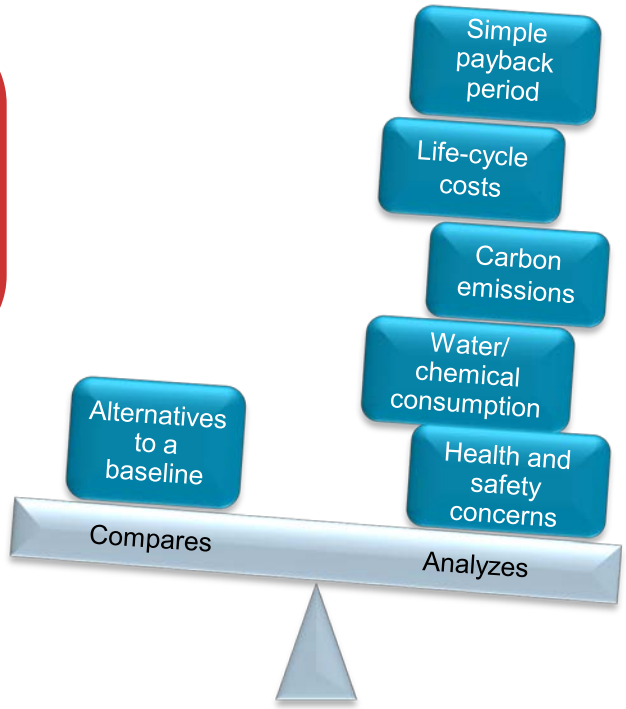
- ✓ Implemented “quick-win” recommendations
  - Quick payback period
  - Relatively small investment
  - Not complicated
- ✓ Proceeded with feasibility study and robust cost/benefit analysis of 8 additional engineering-intensive recommendations

# Example of Cost-Benefit Analysis

Cost/Benefit Analysis for **Photovoltaic (PV) Solar Arrays at Six Meter Buildings and Central Facilities Building (CFB) Using On-Base Electricity Rates (Rate Schedule 9) (1-7)**

Date of Evaluation **12/16/2010**
Operable Unit **1**
System **Groundwater Containment System (GCS)**

| Parameter | Baseline | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 |
|---|---|---|---|---|---|
| Equipment/Method/Procedure | Grid Power | 900 W PV Array at 4 Small Meter Buildings | 1.4 kW PV Array at 2 Large Meter Buildings | 9.9 kW PV Array at CFB | PV Array at All Buildings |
| **Non-recurring Costs** | | | | | |
| Field Labor ($) | $ - | $ 4,070 | $ 2,030 | $ 3,050 | $ 9,150 |
| Engineering/Design Labor ($) | $ - | $ 5,410 | $ 5,410 | $ 5,410 | $ 5,410 |
| Administration ($) | $ - | $ 2,350 | $ 2,350 | $ 2,350 | $ 2,350 |
| **Total Labor Cost ($)** | **$ -** | **$ 11,830** | **$ 9,790** | **$ 10,810** | **$ 16,910** |
| Mileage ($) | $ - | $ 410 | $ 230 | $ 290 | $ 470 |
| **Total Other Direct Costs ($)** | **$ -** | **$ 410** | **$ 230** | **$ 290** | **$ 470** |
| Installation Subcontractor for Alternative ($) | $ - | $ 26,980 | $ 18,590 | $ 58,390 | $ 103,960 |
| **Total Subcontractor Costs ($)** | **$ -** | **$ 26,980** | **$ 18,590** | **$ 58,390** | **$ 103,960** |
| ***Subtotal*** | ***$ -*** | ***$ 39,220*** | ***$ 28,610*** | ***$ 69,490*** | ***$ 121,340*** |
| **Recurring Costs** | | | | | |
| kWhr Required For System Operation (kWhr/yr) [a] | 233,928 | 233,928 | 233,928 | 233,928 | 233,928 |
| kWhr Produced by Alternative Oct - Apr (kWhr/yr) [b] | - | 2,516 | 1,956 | 6,850 | 11,322 |
| kWhr Produced by Alternative May - Sept (kWhr/yr) [b] | - | 2,520 | 1,960 | 6,860 | 11,340 |
| kWhr Required from Grid Oct-Apr (kWhr/yr) | 176,580 | 174,064 | 174,624 | 169,730 | 165,258 |
| kWhr Required from Grid May-Sept (kWhr/yr) | 57,348 | 54,828 | 55,388 | 50,488 | 46,008 |
| Average Peak Load Savings by Alternative Oct-Apr (kW) [b][c] | - | 2.9 | 2.2 | 7.8 | 12.8 |
| Average Peak Load Savings by Alternative May-Sept (kW) [b][c] | - | 2.7 | 2.1 | 7.4 | 12.3 |
| Cost per year savings using PV array ($/yr) | $ - | $ 470 | $ 380 | $ 1,390 | $ 2,240 |
| Cost per year from Grid Rate Schedule ($/yr) | $ 6,050 | $ 5,580 | $ 5,670 | $ 4,660 | $ 3,810 |
| ***Subtotal*** | ***$ 6,050*** | ***$ 5,580*** | ***$ 5,670*** | ***$ 4,660*** | ***$ 3,810*** |
| **Replacement Costs** | | | | | |
| Life Cycle | 25 | 25 | 25 | 25 | 25 |
| Replacement Costs ($)[d] | $ - | $ 11,070 | $ 8,300 | $ 26,730 | $ 46,100 |
| ***Subtotal*** | ***$ -*** | ***$ 11,070*** | ***$ 8,300*** | ***$ 26,730*** | ***$ 46,100*** |
| ***Simple Payback Period (yrs)*** | **N/A** | **107** | **97** | **69** | **75** |
| ***Anticipated Life-Cycle Costs (20 year)*** | $ 121,000 | $ 178,720 | $ 170,360 | $ 185,990 | $ 216,590 |
| ***Anticipated Life-Cycle Cost Savings (20 year)*** | **N/A** | **$ (57,720)** | **$ (49,360)** | **$ (64,990)** | **$ (95,590)** |

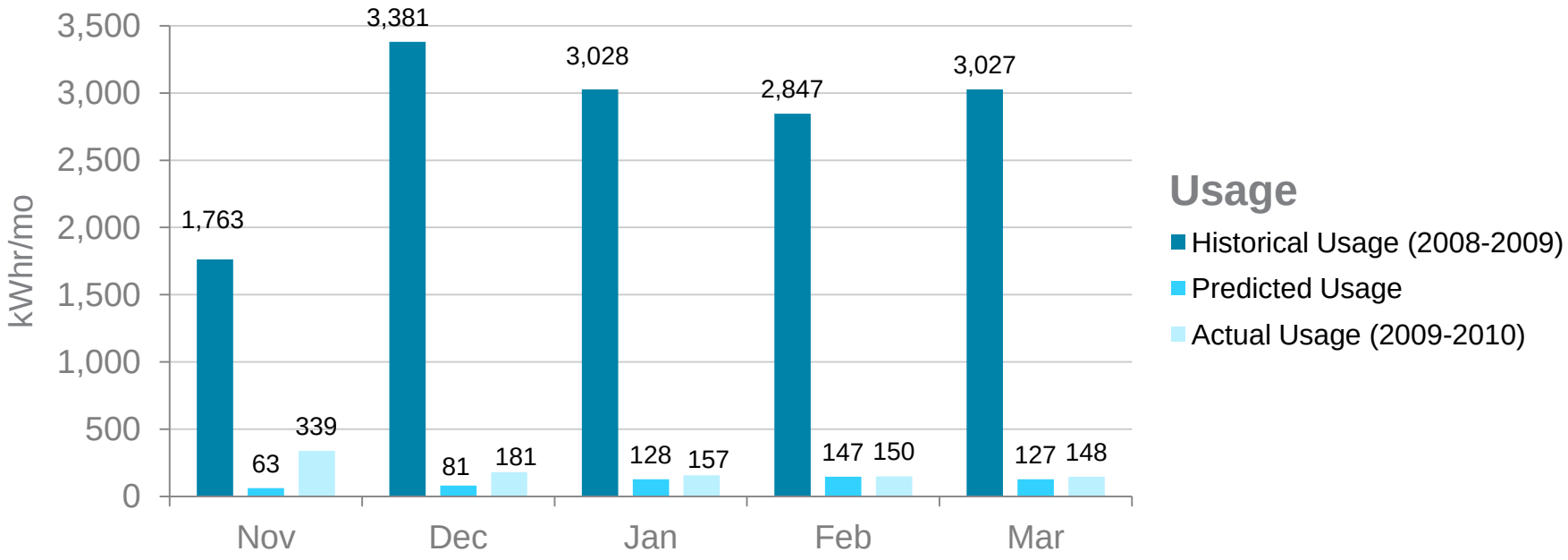


# Selected Projects from Cost/Benefit Analyses

4 of the 8 projects got green light for implementation

- Inactivate HVAC at system process building and installed heat trace on piping
- Maximize use of off-peak electricity rates for extraction wells at two on-Base OUs instead of pumping 24/7
- Inactivate air stripper and route extracted groundwater directly to sanitary sewer
- Replace existing landscaping with xeriscaping at two off-Base sites located in residential neighborhoods

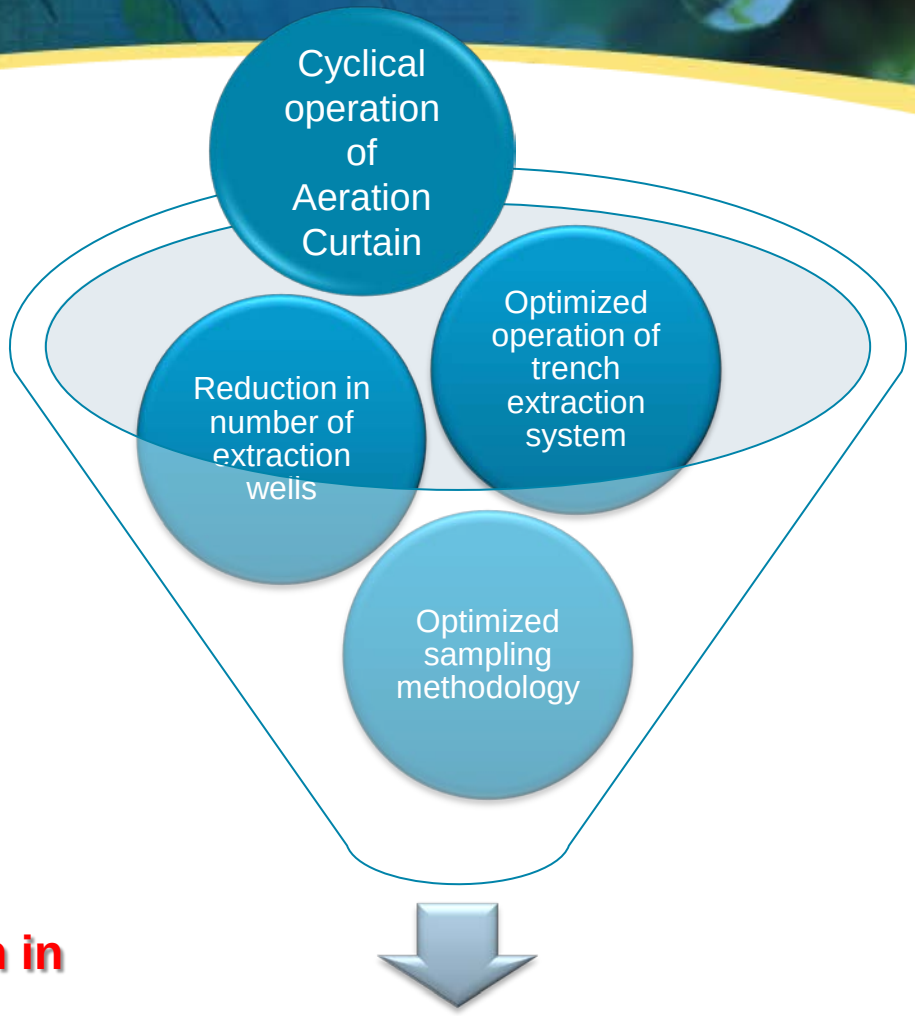
# Example of Measurement & Verification Approach



# Projects Identified by O&M Contractors

*Primary Incentive:  Labor Savings*

# Recommendations Identified by O&M Contractors




**Implementation plan in place for each recommendation to ensure no deterioration in system performance**

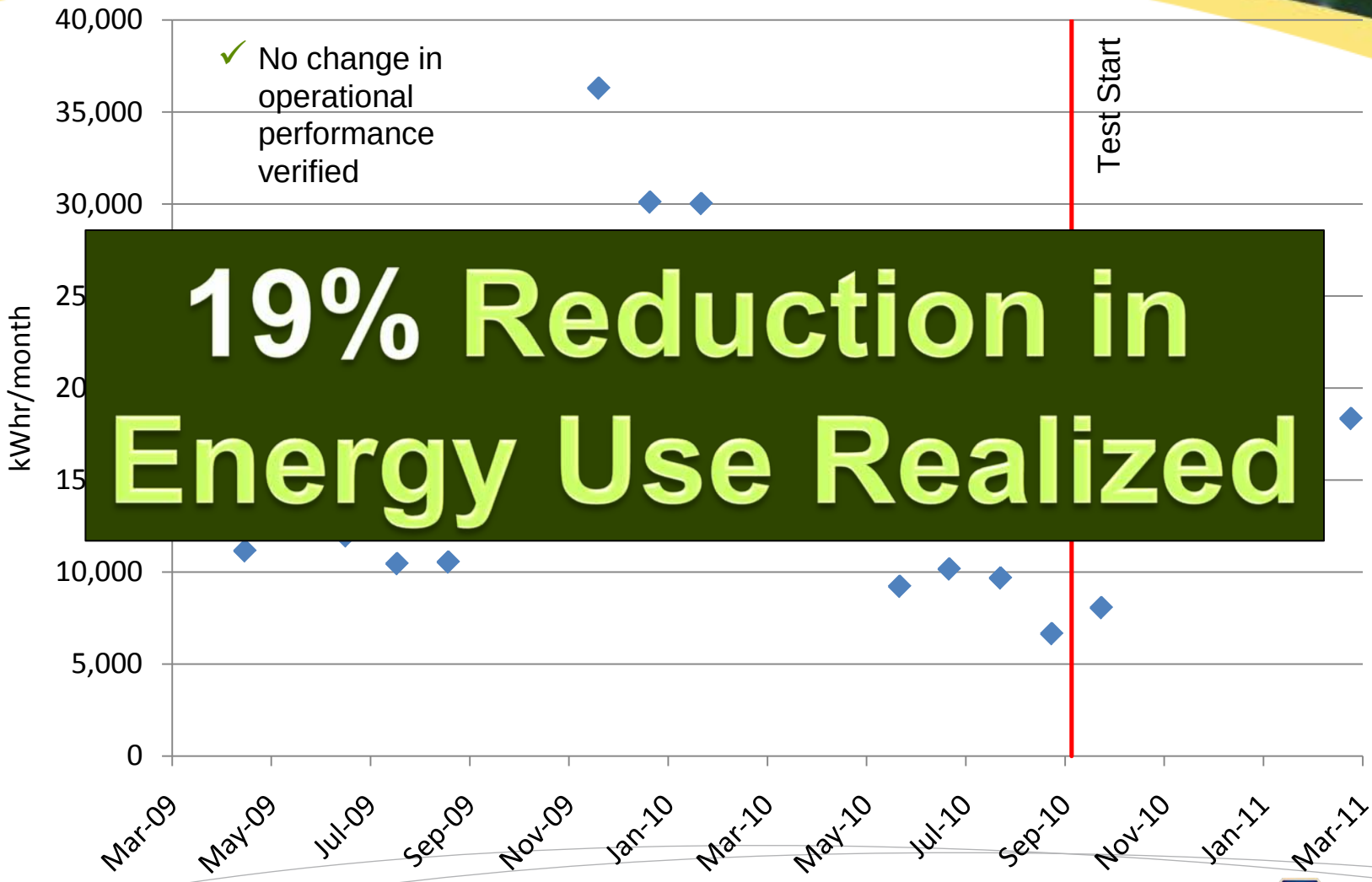
**Labor Savings to O&M Contractor**

# Results for Implemented Projects and Predicted Results for Planned Projects

# Cyclical Operation of Aeration Curtain

- Alternated aeration operations among 3 modules on 24-hour increments instead of all modules 24/7
- Test performed with existing blower therefore no electricity savings realized during 3-month test
- Implemented recommended modifications in March 2011
- Projected:
  - 35 to 45% electricity savings
  - Payback period = 7 years

# Operation of Reduced Number of Extraction Trenches




**19% Reduction in Energy Use Realized**

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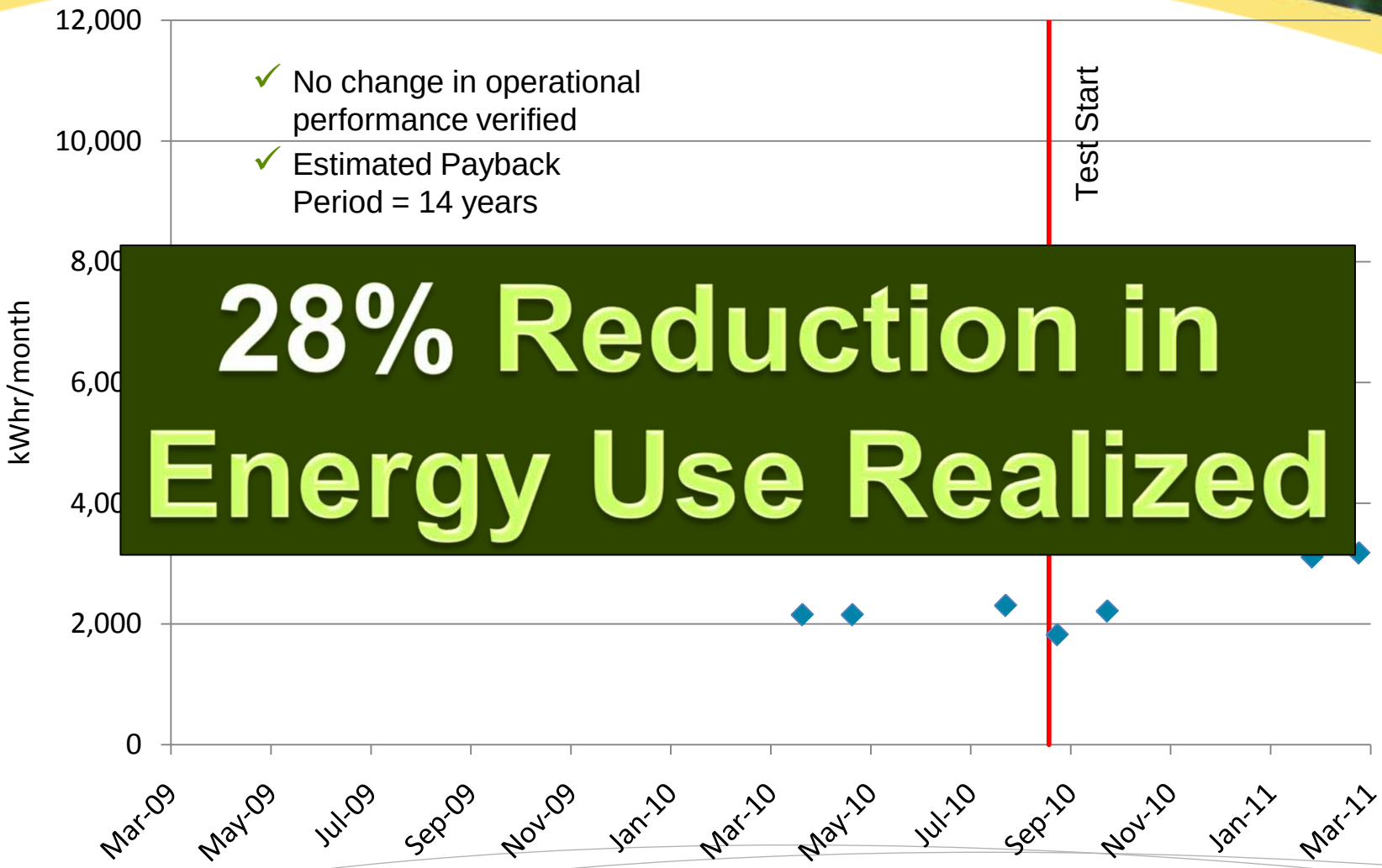
# Operation of Reduced Number of Extraction Wells

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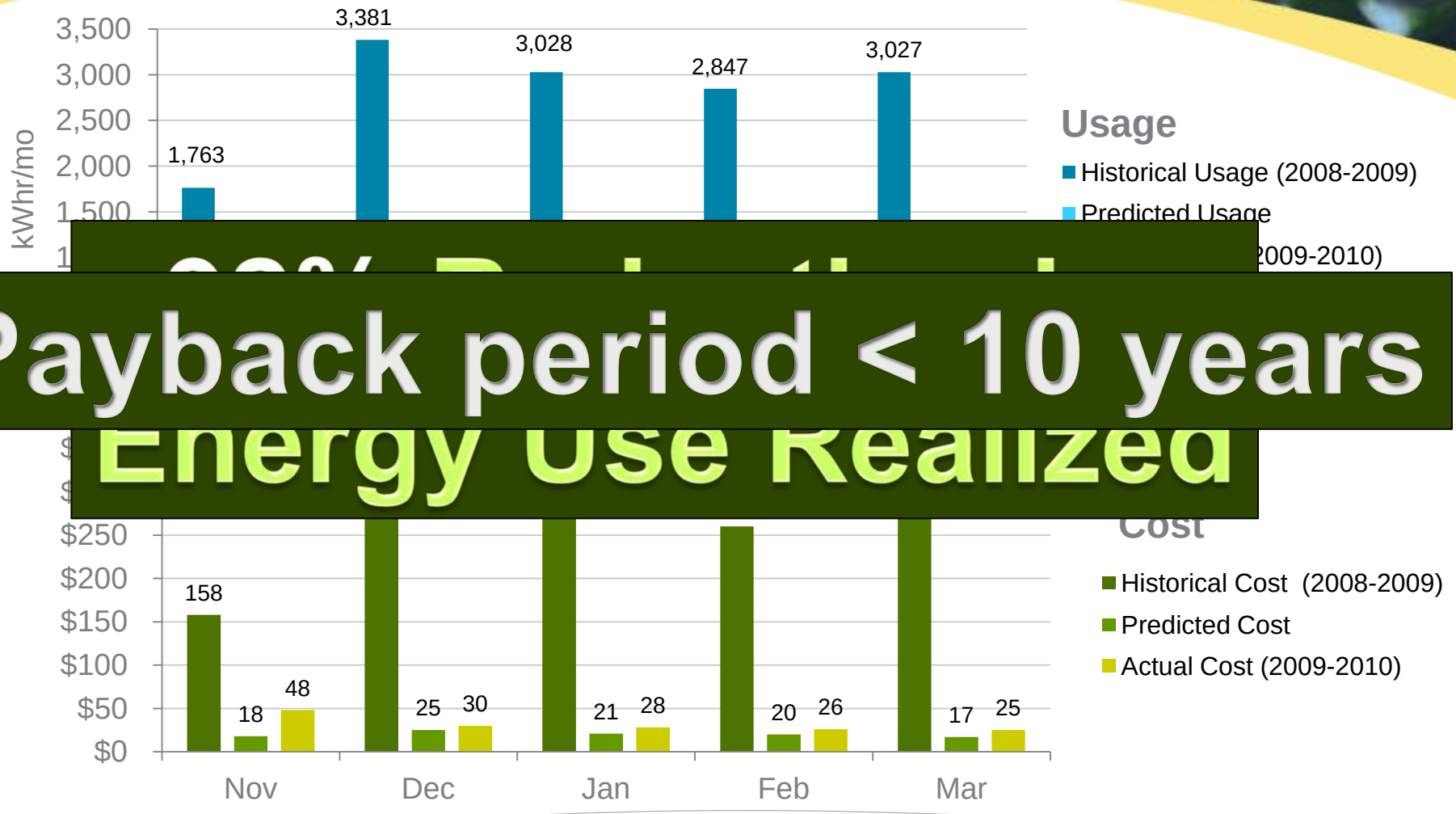
# Implemented Passive Sampling Basewide

- Changing standard purge and low-flow sampling to passive methodology (Hydrasleeve)
- Projected:
  - 58% $CO_2$ emission reduction
  - 61% labor and equipment savings
  - 99.8% reduction in water use/extraction/treatment
  - $5.4M over 20 years

# HVAC Decommissioning

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# Summary of Planned Projects

**Combined estimated payback for planned projects = 3.7 years**

**Estimated Water Savings = 945,000 gallons/year**

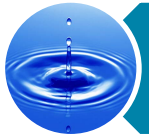
## STATUS

- Waiting on funding approval
- Implementation anticipated in Spring/Summer 2011

# Total Savings from Implementation

Energy Reductions – **200,000 kWh/year (16%)**

$CO_2$ Emission Reductions – **220,000 lbs/year (17%)**



Water Reductions – **1,000,000 gal/year**

Investment – **$530,000**

Program Savings – $**430,000/year (11%)**

Overall Payback Period – **1.2 years**

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# Lessons Learned

- ✓ Implement quick wins
- ✓ Labor savings outweighed energy savings
- ✓ M&V plans critical to understanding true effect of project
- ✓ Technology insertion may make more sense than system optimization
- ✓ Design systems with future operations in mind – retrofitting costly
- ✓ Contract incentives to identify and share in energy saving ideas
- ✓ Longer-duration contracts
- ✓ Ability to bundle energy-saving projects
- ✓ Methodology transferrable

# Discussion

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